

# Operating Experience Weekly Summary 97-53

*December 26, 1997 through January 1, 1998*

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## **EVENTS**

### **1. ACID LEAK FROM TANK INLET VALVE**

On December 15, 1997, at the Savannah River Site H-Canyon, approximately 2 gallons of acid leaked from a tank automatic inlet valve soon after operations personnel performed a valve line-up to transfer acid between two tanks. Facility personnel noticed the leak and reported it to control room personnel. They immediately contacted radiation control and industrial hygiene personnel to determine the appropriate response and personal protection requirements. The radiation control officer required personnel in the immediate area of the spill to wear respiratory protection until the spill was cleaned up. Operations personnel washed the spill area with water until acid concentrations were reduced to zero parts per million. Investigators determined that the leaking valve, made of carbon steel, had been corroded through by the 50 percent nitric acid in less than a month. Improper material selection caused a nitric acid leak, interrupted process operations, and created a personnel safety and health hazard. (ORPS Report SR--WSRC-HCAN-1997-0053)

Investigators determined that maintenance mechanics recently replaced the automatic inlet valve with a carbon steel valve. They also determined that the mechanics installed the valve in accordance with workbook instructions. The valve is "general services not authorization basis related" equipment. During a critique, the first line supervisor said that he inadvertently ordered the wrong valve. Investigators also determined that the two maintenance mechanics who shop-checked and installed the valve failed to recognize that the wrong valve had been procured. Long-term corrective actions are being developed. Immediate actions included the following.

- The facility manager stopped all 50 percent nitric acid transfers until the valve is replaced.
- The facility manager issued a shift order requiring the shift technical engineer to verify that the correct material is installed in any hazardous system.
- Separations maintenance personnel performed a visual walk-down of acid valves to confirm that the remaining valves are stainless steel.

NFS has reported similar events involving improper material selection in the Weekly Summary. Following are some examples.

- Weekly Summary 97-49 reported on two 55-gallon drums of phosphoric acid that ruptured and spilled acid onto the floor of a storage cell area at Pacific Northwest National Laboratory. Failure to select the appropriate drum type for storing phosphoric acid led to a hazardous spill and could have resulted in personnel injuries, exposures to the hazardous drum contents, or facility damage. (ORPS Report RL--PNNL-PNNLBOPER-1997-0022)
- Weekly Summary 94-43 reported that the NRC issued a report describing an event involving a lube oil fire inside the containment at a commercial nuclear power plant. The fire originated at a cracked, 1-inch polyvinylchloride pipe coupling in a line from the lube oil reservoir to the bearing lift pump. The architect-engineer chose polyvinylchloride because it provided electrical isolation between the safety-related reactor coolant pump motor and the non-safety-related bearing oil lift pump (ungrounded) motor. This material was less than adequate, and the coupling was replaced with a steel dielectric union. (NRC Morning Report October 21, 1994, MR Number H-94-0096)

OEAF engineers searched the ORPS database for similar occurrences and found 11 reports that involved corrosion because of improper material selection. The following are descriptions of these events.

- Corrosive soil conditions were not recognized, resulting in the collapse of a 200-foot tower.
- Waste was stored in incompatible drum, resulting in a radioactive spill (two occurrences).
- A carbon steel plug installed in a copper water line corroded, resulting in water damage (two occurrences).
- A carbon steel pipe on a radiological waste line corroded through because of acidic waste, resulting in a radioactive spill.
- Acid fumes corroded the fusible link of a fire system, resulting in the inadvertent activation of the fire system.
- Acid fumes corroded a metal security tag, resulting in an inability to identify materials.
- A carbon steel floor drain plug corroded through because of acidic solutions that collected on the drain floor, resulting in a hazardous material release to the environment.
- A pressure gauge brass fitting corroded from exposure to acid, resulting in a spill of 64 percent nitric acid.
- An aluminum cap to a sodium hydroxide line corroded, resulting in a hazardous material release to the environment.

Occurrences resulting from improper material selection are uncommon. OEAF engineers could not identify a pattern of repeating occurrences. For the 11 occurrences discussed above, the operating environment either changed with time or was not identified. In all cases, the failed, corroded materials were replaced with materials more suited to their operating environment.

These events highlight the importance of proper material selection. Even in systems that are not authorization basis related, and where less rigorous procurement, testing, and inspecting requirements apply, improper material selection can have severe environmental, safety, and health consequences. DOE 5700.6C, *Quality Assurance*, specifies criteria for procurement and acceptance testing. These criteria discuss controls for selection and determination of suitability of purchased items. Other guidelines for parts procurement can be found in DOE-STD-1070-93, *Guidelines to Good Practices for Procurement of Parts, Materials, and Services at DOE Nuclear Facilities*, and DOE-STD-1071-94, *Guidelines to Good Practices for Material Receipt, Inspection, Handling, Storage, Retrieval, and Issuance at DOE Nuclear Facilities*.

**KEYWORDS:** acid, corrosion, material compatibility, procurement

**FUNCTIONAL AREAS:** Procurement, Training and Qualifications

## 2. OPERATOR SAMPLES THE WRONG TANK

On December 18, 1997, an operator inadvertently sampled the wrong low-activity waste tank in a building at the Savannah River Site. The operator took the sample to test for stratification in the tank as required by the waste certification program. The operator was supposed to sample tank D, but drew the sample from tank C. The two tanks, which are not labeled, are located together in a below-grade cell in the building. Sampling the tank required the operator to enter a confined space that was an airborne radioactivity area. The last time personnel entered this cell was in 1991. Supervisors conducted a pre-job briefing, but they did not discuss the orientation of the two tanks or review drawings that would have shown the configuration of the tanks in the cell. This event is significant because the lack of equipment labeling and the failure to review drawings or discuss tank orientation during the pre-job briefing were causal factors in sampling the wrong tank. (ORPS Report SR--WSRC-LTA-1997-0040)

A radiological control inspector, a maintenance mechanic, and the operator assembled for a pre-job briefing. Supervisors discussed the scope of the work, the radiological work permit, the confined space permit, the work clearance permit, and the lockout. They did not discuss the orientation of the two tanks inside the cell, but stated that the tank cover had a bolted flange. Access to the cell was through a 4-foot-square access port and ladder. There were no lights installed in the cell, which required the use of drop cords for task lighting. The operator practiced drawing samples using clean water and the sampling device.

Following the briefing, the inspector, mechanic, and operator donned the required personal protective equipment and prepared to enter the confined space of the cell. Before entry the inspector and operator briefly discussed which of the two tanks was tank D. They both believed the tank was the farthest from the access ladder. The inspector and mechanic entered the cell and noticed that neither tank was labeled and that the cover on one tank was plexiglass and held on by C-type clamps. They proceeded to the farthest tank, and the mechanic removed the bolted flange cover in accordance with procedure and the pre-job briefing. The operator entered the cell to sample the tank and noticed the tank level was below the expected level of 4,600 gallons. The operator stopped and contacted the operations manager who stopped the job for an hour to discuss the tank level concern with a technical engineer. The operations manager authorized the operator to continue sampling after they assumed the tank level instrument was in error. The operator then drew samples from tank C rather than tank D.

Investigators determined that the workers and supervisors continued with the sampling operation after the workers identified issues that raised doubts about the tank to be sampled. The sampling operation could have been stopped at several points to verify the orientation of the tanks: after the workers (1) found the tanks were not labeled, (2) noticed the two tank covers were different, and (3) observed the tank level was not as expected. Investigators also determined that configuration control of the tanks was lacking because there were no labels and the tank covers were different.

The facility manager will implement the following corrective actions.

- Correct the tank labeling deficiency.
- Develop better checklists to ensure that pre-job briefings are adequate.
- Establish system files that include pertinent information on past activities, such as previous entries into the cell, that can be reviewed before future work activities.

OEAF engineers reviewed another event this week where work planners overlooked an important issue when they planned a job that had never been performed. On December 17, 1997, at the Los Alamos National Laboratory, 2 gallons of plutonium-contaminated water leaked onto the floor at the Chemistry and Metallurgy Research Facility when operators used a water hose to wash down the inside of an exhaust plenum before repairing a failed turning vane. The inside of the exhaust plenum was highly contaminated with isotopes of plutonium. A radiological control technician and operator wore the requisite personal protective equipment. Work planners prepared a comprehensive work package that included (1) a hazard analysis, (2) special and radiological work permits, (3) an as low as reasonably achievable review, and (4) a pre-job briefing. However, during the planning and pre-job briefing, no one questioned the possibility that the exhaust plenum or the connecting ductwork might leak. (ORPS Report ALO-LA-LANL-CMR-1997-0028)

These two events underscore the importance of performing a thorough review of the job task during the work-planning phase and conducting a good pre-job briefing to ensure workers have a complete understanding of the task and to address any final concerns. In both of these events work planners attempted to ensure that hazards were identified, permits were in place, and workers were protected. However, an important issue was missed in each event. At Savannah River the correct tank was not positively identified before sampling; at Los Alamos, the possibility that the exhaust plenum ductwork could leak was not questioned or planned for. It is also important for workers to maintain a questioning attitude when they observe unexpected conditions. This is particularly important when the task has never been performed or is performed infrequently. Work control practices, such as stopping a job when workers raise questions or are uncertain about equipment configuration, should be exercised by supervisors.

DOE facility managers should verify that their labeling programs are consistent with DOE 5480.19, *Conduct of Operations Requirements for DOE Facilities*. Chapter XVIII, "Equipment and Piping Labeling," states that a good labeling program will help reduce operator and maintenance errors resulting from incorrect identification of equipment. Chapter VIII, "Control of Equipment and System Status," states that DOE facilities are required to establish administrative control programs to handle configuration changes resulting from maintenance, modifications, and testing activities. DOE-STD-1044-93, *Guide to Good Practices for Equipment and Piping Labeling*, provides valuable information on label information, placement of labels, color-coding, readability, and means of attachment and placement. DOE 4330.4B, *Maintenance Management Program*, states that maintenance supervisors should routinely monitor the proper use of pre-job briefings. Article 324 of DOE/EH-0256T, *Radiological Control Manual*, provides information on the minimum requirements for pre-job briefings associated with radiological work activities.

**KEYWORDS:** pre-job briefing, pre-job planning, labeling, configuration control, work control

**FUNCTIONAL AREAS:** Work Planning, Radiation Protection, Configuration Control

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WATER HAMMER PROBLEMS AT ROCKY FLATS

*OEAF FOLLOW UP ACTIVITY*

CORRECTION TO WEEKLY SUMMARY 97-39, ARTICLE 2

**97-43**

NORMAL POWER LOSS TO CRITICALITY SYSTEM MAIN PANEL  
OPERATOR TRANSFERS MATERIAL WITHOUT A PROCEDURE  
VACUUM PUMPS WITH TRITIUM CONTAMINATION SHIPPED OFF-SITE  
SPENT FUEL CANISTER DROPS WHEN HANDLING FIXTURE DISENGAGES

*OEAF FOLLOWUP ACTIVITY*

CORRECTION TO WEEKLY SUMMARY 97-42, ARTICLE 1, DRUMS OF CONTAMINATED MATERIAL FALL FROM TRUCK

**97-44**

SUBCONTRACTORS BURNED FROM ELECTRICAL FLASHOVER  
OPEN REACTOR CONFINEMENT PENETRATIONS AT IDAHO  
CONSTRUCTION WORKER RECEIVES ELECTRIC SHOCK  
PIPEFITTER FALLS THROUGH ROOF PENETRATION  
LOAD EXCEEDS POSTED RATING OF HOIST  
INADEQUATE WORK CONTROLS FOR EXCAVATION ACTIVITIES

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DE-ENERGIZATION OF MULTIPLEXOR CABINET IMPACTS OPERATIONAL SAFETY REQUIREMENT INSTRUMENTATION

**97-45**

UNEXPECTED RELEASE OF NITROGEN DIOXIDE DURING RESIN REGENERATION  
HOT SLAG IGNITES FLEXIBLE EXHAUST DUCT  
WRONG MOTOR CONTROL CENTER LOCKED OUT/TAGGED OUT  
TECHNICIAN SHOCKED WHEN CAPACITOR DISCHARGES  
ESCORTS FAIL TO COMPLY WITH RADIOLOGICAL WORK PERMIT  
LOCKOUT/TAGOUT VIOLATIONS

**97-46**

MIS-WIRED WATTMETER CAUSES SHORT CIRCUIT AND EQUIPMENT DAMAGE  
PORTABLE EYEWASH STATIONS FAIL TO MEET FLOW REQUIREMENTS  
CONFINED SPACE ENTRY VIOLATION  
OPERATIONAL SAFETY REQUIREMENT VIOLATIONS AT ROCKY FLATS  
INCOMPLETE FIRE ALARM SYSTEM SURVEILLANCE VIOLATES OPERATIONAL SAFETY REQUIREMENTS  
CRITICALITY INFRACTIONS AT ROCKY FLATS

**97-47**

DRUMS EXCEED LOWER FLAMMABILITY LIMIT  
CONSTRUCTION WORKER SEVERS ENERGIZED 120-VOLT LINE  
UNDERGROUND CONTAMINATION DISCOVERED DURING EXCAVATION  
FUME HOOD FACE VELOCITIES EXCEED OPERATIONAL SAFETY REQUIREMENT LIMITS  
LASER SAFETY VIOLATION

*OEAF FOLLOW-UP ACTIVITIES*

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**97-48**

UNEXPECTED REACTION CAPTURED ON FILM  
DEACTIVATION PLANNING ASSUMPTIONS RESULT IN WATER HAMMER  
SAFETY CLASS TRANSFER LINES FAIL TO MEET AUTHORIZATION BASIS

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UNREVIEWED SAFETY QUESTION ON INADEQUATE CRITICALITY ALARM COVERAGE  
SIX WORKERS AND FACILITY CONTAMINATED AT IDAHO  
CORROSIVE DEGRADATION OF STEEL COLUMN

**97-49**

OPERATOR SPRAYED WITH SULFURIC ACID  
SPRINKLER HEADS FAIL UNDERWRITERS LABORATORY TEST  
OPERATOR SPRAYED WITH CONTAMINATED SLUDGE  
PLASTICIZED LINER FOUND IN EMERGENCY DIESEL GENERATOR STRAINER  
CONTAMINATED LUBRICANT AFFECTS OPERATION OF MOTOR-DRIVEN RELAYS

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CHEMICAL REACTION RUPTURES DRUMS

**97-50**

LOCKOUT/TAGOUT VIOLATIONS AT THE SAVANNAH RIVER SITE  
LOSS OF EXHAUST VENTILATION RESULTS IN PRESSURE INVERSION  
GLOVEBOX SHIELDING REMOVED WITHOUT APPROVAL  
FIRE FIGHTER'S ACTIONS RESULT IN A NEAR MISS  
FAILURE TO PROPERLY INVENTORY RADIOACTIVE MATERIALS WHEN RECEIVED  
WORKERS SPREAD DEBRIS CONTAINING ASBESTOS

*PRICE-ANDERSON AMENDMENTS ACT (PAAA) INFORMATION*

DEPARTMENT OF LABOR CONFIRMS RETALIATORY ACTIONS TAKEN AGAINST WORKER FOR RAISING SAFETY CONCERNS

**97-51**

PERSONNEL CONTAMINATION – ASSUMED RISK FOR CERTAIN RADIOLOGICAL WORK ACTIVITIES  
NRC PROPOSES \$2.1 MILLION FINE FOR VIOLATIONS AT A COMMERCIAL NUCLEAR UTILITY

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MISCONFIGURED TRANSFER SWITCH AFFECTS DIESEL GENERATOR OPERATION  
WASTE PACKAGED BY MAINTENANCE EMPLOYEE WITH EXPIRED TRAINING

**97-52**

INSUFFICIENT PARTICIPATION IN JOB-SPECIFIC BIOASSAY PROGRAM  
FIRE PROTECTION CONCERNS IDENTIFIED AT OAK RIDGE Y-12 SITE

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IMPROPER ELECTRICAL LINEUP CAUSES POWER OUTAGE  
INADEQUATE SHIFT TURNOVER RESULTS IN VIOLATION  
PRICE-ANDERSON AMENDMENTS ACT (PAAA) INFORMATION  
WESTINGHOUSE SAVANNAH RIVER FINED FOR WORKER-SAFETY VIOLATIONS

**97-53**

ACID LEAK FROM TANK INLET VALVE  
OPERATOR SAMPLES THE WRONG TANK  
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